

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Original) An apparatus for detecting anomalies in tissue, the apparatus comprising:
 - at least one palpation probe for palpating tissue;
 - at least one detector for detecting the distance traveled by and the velocity of motion of the palpation probe as it palpates the tissue; and
 - a controller in communication with the palpation probe and the detector for measuring a characteristic value of the probed tissue.
2. (Original) The apparatus according to claim 1 wherein the palpation probe is operably connected with an electro-magnetic or electro-mechanical actuator.
3. (Original) The apparatus according to claim 1 wherein the detector includes an optical encoder or a magnetic encoder.
4. (Original) The apparatus according to claim 1 including at least one sensor for mapping the surface of the tissue.
5. (Original) The apparatus according to claim 1 wherein the controller produces a dimensional mapping of the surface of the tissue.
6. (Original) The apparatus according to claim 4 wherein the at least one sensor includes a camera, an autofocus system, a rangefinder, an acoustic sensor, or an optical sensor.
7. (Original) The apparatus according to claim 4 wherein the at least one sensor determines the distance from the palpation probe to the surface of the tissue.

8. (Original) The apparatus according to claim 4 wherein the at least one sensor determines the angle between the longitudinal axis of the palpation probe and the surface of the tissue.

9. (Original) The apparatus according to claim 1 including a second detector for measuring the color or temperature, or both, of the tissue.

10. (Original) The apparatus according to claim 1 wherein the controller produces a signal causing the actuator to move the palpation probe a distance, with a force, or for a time that is detected, or some combination thereof, against the surface of the tissue.

11. (Original) The apparatus according to claim 10 wherein the controller determines a characteristic value for the probed tissue from the detected distance, force, or time, or some combination thereof, traveled by the probe.

12. (Original) The apparatus according to claim 1 wherein the controller determines a characteristic value for the probed tissue from the detected distance traveled by the probe.

13. (Original) The apparatus according to claim 1 wherein the controller determines a characteristic value for the probed tissue from the detected distance traveled by the probe relative to a predetermined distance or time.

14. (Original) The apparatus according to claim 1 wherein the controller positions the palpation probe at a predetermined location against the tissue.

15. (Original) The apparatus according to claim 1 wherein the controller positions the longitudinal axis of the palpation probe substantially perpendicular to the surface of the tissue.

16. (Original) The apparatus according to claim 1 wherein the controller positions the palpation probe at a series of predetermined locations about the tissue.

17. (Original) The apparatus according to claim 16 wherein the series of predetermined locations encompasses the entire tissue area under investigation.

18. (Original) The apparatus according to claim 16 wherein the controller actuates the palpation probe at each location, and stores in a memory the location of the palpation probe, the detected distance, the velocity motion, or a characteristic value of the tissue, or some combination thereof.

19. (Original) The apparatus according to claim 18 wherein the controller creates a multi-dimensional model of the probed tissue using the characteristic value of the tissue.

20. (Original) The apparatus according to claim 18 wherein the controller determines a boundary using the characteristic value of the tissue.

21. (Original) The apparatus according to claim 1 including a tissue sampling device for obtaining a sample of the tissue.

22. (Original) The apparatus according to claim 21 wherein the sampling device is an invasive, or non-invasive device, or both.

23. (Original) The apparatus according to claim 21 wherein the sampling device is a needle, aspirator, coring device, ultrasound device, temperature sensing device, electromagnetic sensing device, or an impedance measurement device.

24. (Original) The apparatus according to claim 21 comprising an anesthetic delivery device to anesthetize an area proximate to the sampled tissue.

25. (Original) The apparatus according to claim 20 wherein the controller is in communication with the sampling device.

26. (Original) The apparatus according to claim 20 wherein the controller positions the sampling device at a preselected region of the tissue.

27. (Original) An apparatus for detecting differences in breast tissue, the apparatus comprising:

a palpation probe for palpating breast tissue;

a detector for detecting the distance traveled by or the velocity of motion of the palpation probe; and

a controller in communication with the palpation probe and the detector, the controller determining a breast tissue value for the probed breast tissue from the detected distance or velocity of motion.

28. (Original) The apparatus according to claim 27 wherein the palpation probe is operably connected with a solenoid.

29. (Original) The apparatus according to claim 27 wherein the controller positions the palpation probe at a predetermined location against the breast tissue .

30. (Original) The apparatus according to claim 27 wherein the controller applies a predetermined voltage to the solenoid to move the shaft a distance or speed determined by the resistance of the breast tissue .

31. (Original) The apparatus according to claim 27 wherein the detector includes an optical encoder or a magnetic encoder.

32. (Original) The apparatus according to claim 27 wherein the movement of the probe is detected by an encoding device.

33. (Original) The apparatus according to claim 32 wherein the encoding device is an optical encoder or a magnetic encoder.

34. (Original) An apparatus for detecting differences in breast tissue, the apparatus comprising:

a detection device having a palpation probe for palpating breast tissue and a detector for detecting the distance traveled by and the velocity of motion of the palpation probe;

a location sensor for detecting the location of the breast tissue for producing an image map of the breast;

a controller in communication with the detection head and the location sensor, the controller positioning the palpation probe at a predetermined location along the breast tissue and directing the palpation probe against the breast tissue; and

a memory device for storing the distance traveled and velocity of motion of the probed breast tissue.

35. (Original) The apparatus of claim 34 wherein the location sensor includes an optical sensor.

36. (Original) The apparatus of claim 34 wherein the controller includes a microprocessor.

37. (Original) The apparatus of claim 34 wherein the location sensor is incorporated with the detection device.

38. (Original) The apparatus of claim 34 including a processor for determining a breast tissue value for the probed breast tissue from the detected distance and velocity of motion of the palpation probe for producing a map of the breast tissue values.

39. (Original) The apparatus of claim 34 wherein the detection device includes a plurality of palpation probes.

40. (Original) An apparatus for detecting differences in breast tissue, the apparatus comprising a detection head having at least one palpation probe for palpating the breast tissue of a patient, and at least one detector for detecting the distance traveled by, or the velocity of motion of, or the time of motion of, said at least one palpation probe.

41. (Original) The apparatus of claim 40 including a location device having at least one sensor for determining the location of the breast tissue of the patient, the at least one sensor for mapping the surface of the breast tissue.

42. (Original) The apparatus of claim 41a including a controller in communication with the detection head and the location head for positioning the palpation probe at a predetermined location against the breast tissue and directing the palpation probe against the breast tissue.

43. (Original) The apparatus of claim 42 including a memory for storing the detected distance and velocity motion for the probed breast tissue.

44. (Original) The apparatus of claim 43 including a data processor for determining a breast tissue value for the probed breast tissue from the detected distance and velocity of motion of the palpation probe.

45. (Original) The apparatus of claim 44 including a breast tissue sampling device for sampling the breast tissue.

46. (Original) A method for detecting differences in breast tissue, the method comprising the steps of:

palpating the breast tissue of a patient with a palpation probe;
detecting a distance traveled by, or a velocity of motion of, or a time in motion of, the palpation probe; and

determining a breast tissue value for the probed breast tissue from the detected distance traveled by, or the velocity of motion of, or the time in motion.

47. (Original) The method according to claim 46 wherein the palpation probe is moved incrementally.

48. (Original) A method for detecting differences in breast tissue, the method comprising the steps of:

(a) positioning a palpation probe at a predetermined location against the breast tissue of a patient;

(b) actuating the palpation probe to move with a predetermined force against the breast tissue;

(c) detecting the distance traveled by and the velocity of motion of the palpation probe;

(d) determining a characteristic value for the probed breast tissue from at least one of the detected distance traveled, or the velocity of motion, or both; and

(e) storing the palpation probe location, detected distance, velocity of motion, or breast tissue value, or a combination thereof, in a memory.

49. (Original) The method of claim 48 which comprises repeating steps (c) through (e).

50. (Original) The method of claim 48 which comprises the step of positioning the palpation probe at an alternate predetermined location against the breast tissue and repeating steps of claim 48.

51-55. (Cancelled)

56. (Original) An apparatus for detecting differences in body tissue, the apparatus comprising:

at least one palpation probe for palpating body tissue;

at least one detector for detecting the distance traveled by, or the velocity of motion of the palpation probe; and

a controller in communication with the palpation probe and the at least one detector for measuring a characteristic value of the probed body tissue.

57. (Original) The apparatus of claim 56 wherein the controller determines whether the body tissue detected is skin, subcutaneous fatty tissue, benign tissue, or cancerous tissue, or a combination thereof.

58. (Original) The apparatus of claim 56 wherein the body tissue detected is located on the face, abdomen, thigh, buttocks, or body.

59. (Original) The apparatus according to claim 56 wherein the palpation probe is operably connected to an electro-magnetic or a electro-mechanical actuator.

60. (Original) The apparatus according to claim 56 wherein the detector is an optical encoder or a magnetic encoder.

61. (Original) The apparatus according to claim 56 including at least one sensor for mapping the surface of the body tissue.

62. (Original) The apparatus according to claim 56 wherein the controller produces multi-dimensional mapping of the surface of the body tissue.

63. (Original) The apparatus according to claim 61 wherein the at least one sensor includes a camera, an autofocus system, a rangefinder, an acoustic sensor, or an optical sensor.

64. (Original) The apparatus according to claim 61 wherein the at least one sensor determines the distance from the palpation probe to the body tissue.

65. (Original) The apparatus according to claim 61 wherein the at least one sensor determines the angle between the longitudinal axis of the palpation probe and surface of the probed body tissue.

66. (Original) The apparatus according to claim 56 including a second detector for measuring the color or the temperature of the probed body tissue.

67. (Original) The apparatus according to claim 56 wherein the controller delivers a signal to the actuator to move the palpation probe with a predetermined force against the body tissue.

68. (Original) The apparatus according to claim 56 wherein the controller determines a characteristic value for the probed body tissue from the detected distance relative to a predetermined distance.

69. (Original) The apparatus according to claim 56 wherein the controller positions the palpation probe at a predetermined location against the body tissue.

70. (Original) The apparatus according to claim 56 wherein the controller positions a longitudinal axis of the palpation probe substantially perpendicular to the surface of the body tissue.

71. (Original) The apparatus according to claim 56 wherein the controller positions the palpation probe at a series of predetermined locations across the body tissue.

72. (Original) The apparatus according to claim 71 wherein the series of predetermined locations encompasses the entire body area under investigation.

73. (Original) The apparatus according to claim 71 wherein the controller actuates the palpation probe at each location and stores in a memory the location of the

palpation probe, the detected distance, the velocity motion, or a characteristic value for the probed body tissue, or a combination thereof.

74. (Original) The apparatus according to claim 73 wherein the controller produces a multi-dimensional model of the characteristic values of the probed body tissue.

75. (Original) The apparatus according to claim 73 wherein the controller determines a characteristic value for the probed body tissue.

76. (Original) The apparatus according to claim 56 including a body tissue sampling device for determining the cancerous state of the sampled body tissue.

77. (Original) The apparatus according to claim 76 wherein the sampling device is an invasive device.

78. (Original) The apparatus according to claim 76 wherein the sampling device is a non-invasive device.

79. (Original) The apparatus according to claim 76 wherein the sampling device is a biopsy device.

80. (Original) The apparatus according to claim 79 wherein the biopsy device is an aspiration device.

81. (Original) The apparatus according to claim 79 wherein the biopsy device removes a tissue sample.

82. (Original) The apparatus according to claim 81 wherein the biopsy device comprises a needle.

83. (Original) The apparatus according to claim 76 wherein the sampling device is an ultrasound device.

84. (Original) The apparatus according to claim 76 wherein the sampling device is a temperature measurement device.

85. (Original) The apparatus according to claim 76 wherein the sampling device is an electromagnetic sensing device.

86. (Original) The apparatus according to claim 85 wherein the sensing device comprises a sensor array.

87. (Original) The apparatus according to claim 86 wherein the sensor array measures low-level electric currents to produce an image of the electrical impedance within the body.

88. (Original) The apparatus according to claim 56 including an anesthetic delivery device to anesthetize an area proximate to the sampled body tissue.

89. (Original) The apparatus according to claim 56 wherein the controller is in communication with the sampling device.

90. (Original) The apparatus according to claim 56 wherein the controller determines the boundary of the detected characteristic values of body tissue.

91. (Original) The apparatus according to claim 73 wherein the controller determines whether the body tissue detected is skin, subcutaneous fatty tissue, benign tissue, or cancerous tissue, or a combination thereof.

92. (Original) The apparatus according to claim 56 including a liposuction device.

93-102. (Canceled)

103. (Original) The apparatus according to claim 4 wherein one sensor includes a digital camera and grid to establish investigation coordinates for use in comparing measurements made at some other time.

104. (Original) The apparatus according to claim 34 wherein the sensor includes a digital camera and grid to establish investigation coordinates for use in comparing measurements made at some other time.

105. (Original) The apparatus according to claim 2 wherein the palpation probe includes an end isolator composed of an electrically insulating material.